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NASA TECH BRIEF

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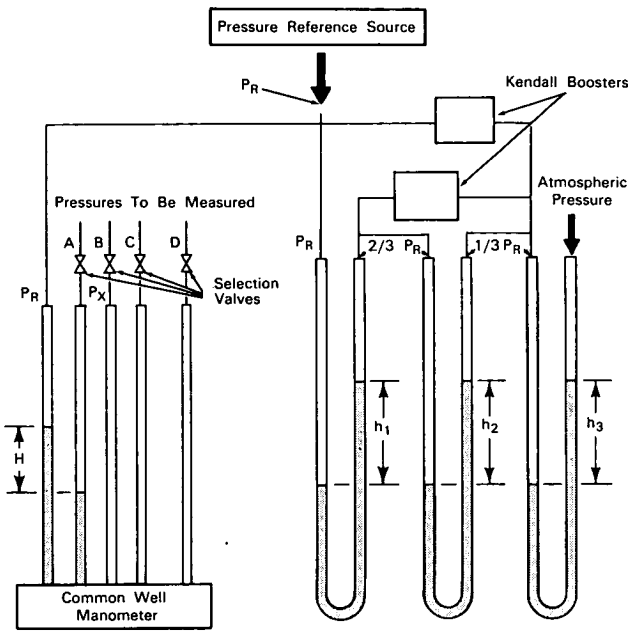
Fluid-Pressure Measurement Apparatus Uses Short-Length Manometer Tubes



A: Selection Valve Open
B, C, D: Selection Valves Closed

The problem: Measuring high fluid pressures by means of manometers. In situations where high pressures occur, an inordinately long column of liquid and tube would be required in a conventional manometer. Liquid blowout could also occur from the open end of such a manometer during pressure surges.

The solution: Use of a system of short-length U-tube manometers in conjunction with a reference pressure which is divided into proportional parts.

How it's done: A reference pressure P_R divided into proportions by (Kendall) ratio boosters is introduced into a U-tube system. The illustration shows three separate U-tubes, with the indicated proportions of the reference pressure applied to the different branches. With this proportioning of the pressures, the difference in the heights, h_1, h_2, and h_3, of the liquid levels in each U-tube is approximately the same ($h_1 \simeq h_2 \simeq h_3 \simeq 1/3\ P_R$), and the reference pressure can therefore be determined by arithmetically adding the

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three level differentials. The reference pressure is also introduced into one branch of a common-well manometer, and the pressure to be measured, P_X, is applied to another branch of the common-well manometer. It is easy to show that for this configuration, $P_X = P_R+H$, or $P_X=H+h_1+h_2+h_3$, where H is the difference in the heights of the liquid levels in the two branches of the manometer in the common well. Since the last branch of the U-tube is open to the atmosphere, P_X is the gage pressure (in terms of the height of the liquid used in the manometer system).

Notes:

1. The reference pressure may be supplied from any convenient source within the pressure system. This pressure need not be constant.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio, 44135
   Reference: B65-10027

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: B.I. Sather
(Lewis-28)